

# Syphilis Control During Pregnancy: Effectiveness and Sustainability of a Decentralized Program

## ABSTRACT

**Objectives.** This study sought to assess the performance, effectiveness, and costs of a decentralized antenatal syphilis screening program in Nairobi, Kenya.

**Methods.** Health clinic data, quality control data, and costs were analyzed.

**Results.** The rapid plasma reagin (RPR) seroprevalence was 3.4%. In terms of screening, treatment, and partner notification, the program's performance was adequate. The program's effectiveness was problematic because of false-negative and false-positive RPR results. The cost per averted case was calculated to be US\$95 to US\$112.

**Conclusions.** The sustainability of this labor-intensive program is threatened by costs and logistic constraints. Alternative strategies, such as the mass epidemiologic treatment of pregnant women in high-prevalence areas, should be considered. (*Am J Public Health.* 2001;91:705–707)

Karoline Fonck, MD, MPH, Patricia Claeys, MD, MPH, Farah Bashir, DMLT, Job Bwayo, MD, PhD, Lieve Fransen, MD, PhD, and Marleen Temmerman, MD, PhD

Pregnant women who are seroreactive to syphilis are at an increased risk for spontaneous abortion, stillbirth, prematurity, and perinatal death.<sup>1–6</sup> In Africa, the reported prevalence of syphilis in pregnancy ranges from 3.6% to 19%.<sup>7–13</sup> Although syphilis screening in pregnancy is a national health policy in most African countries, few screening programs achieve implementation, mainly owing to financial and logistical constraints.

One of the priorities of the Kenyan Sexually Transmitted Diseases Control Program, set up in 1987,<sup>14</sup> was to control syphilis during pregnancy. In 1989, an evaluation of the centralized screening program in Nairobi revealed low effectiveness.<sup>15</sup> Subsequently, in 1992, a decentralized program was put in place with support from the European Commission. This program has since been extended to other locations in Kenya.<sup>16</sup>

The purpose of this study was to assess the effectiveness of this 6-year-old urban decentralized program and to formulate recommendations for future implementation.

## Methods

The main strategy of the syphilis program in Nairobi was the implementation of a decentralized, clinic-based model for the on-site diagnosis and treatment of syphilis-seroreactive pregnant women and their partners. Components of the project included (1) laboratory support, (2) supplies and drugs, (3) training nurses in rapid plasma reagin (RPR) testing and treating seroreactive women with a single dose of 2.4 million international units of benzathine penicillin administered intramuscularly, (4) counseling, (5) partner notification, and (6) supervision and monitoring.

The Macro-Value RPR card test (Becton Dickinson, Cockeysville, Md) was used for RPR testing at the peripheral level and for quality control at the central sexually transmitted disease (STD) referral clinic. The quality control consisted of a blind analysis of all RPR-positive sera and of a random selection of 1 in 10 negative samples.

To analyze the program, we monitored data from the 10 primary health care clinics, quality control data from the referral laboratory, and information on costs.

## Results

Between July 1997 and June 1998, 96% of all pregnant women (n=27377) attending the 10 clinics were screened for syphilis. Main reasons for failure to screen were high workload and lack of electricity, although manual RPR cards were available. Overall, 928 women (3.4%) were RPR positive, and 91% of these women were promptly treated (Table 1). The reasons for nontreatment included absence of the person in charge, unwillingness of the woman to wait for test results, and the policy of some of the clinics to treat the woman simultaneously with the partner.

Overall, 53% of the partners were treated. Partner notification was hampered by the quality of counseling, the casual nature of the partnerships, and a woman's risk of physical abuse when she informed her partner of the STD; hence, women might be reluctant to do so despite the counseling's focus on the well-being of the unborn child.

When we performed quality control, only 69% of the RPR-positive results and 97% of the RPR-negative results were confirmed. The relatively high false-positive rate may be explained by technical constraints, high workload, inadequate training, and slackening of the supervision. There is also anecdotal evidence that some centers report false-positive results on purpose in order to obtain benzathine penicillin for other uses.

The costs of the program include testing, treatment, quality control, yearly refresher training, and supervision. The capital costs (car, rotators, and centrifuges) were discounted over 5 years. The total cost of the syphilis screening program for 1 year was US \$30 996

Karoline Fonck, Patricia Claeys, and Marleen Temmerman are with the International Center for Reproductive Health, Ghent University, Ghent, Belgium. Farah Bashir is with the Department of Public Health, Nairobi City Council, Nairobi, Kenya. Karoline Fonck, Farah Bashir, and Job Bwayo are with the Department of Medical Microbiology, University of Nairobi, Nairobi, Kenya. Lieve Fransen is with the Health-AIDS Unit/DG DEV (Development), European Commission, Brussels, Belgium.

Requests for reprints should be sent to Marleen Temmerman, MD, PhD, ICRH, Ghent University, UZ P3, De Pintelaan, 9000 Ghent, Belgium (e-mail: marleen.temmerman@rug.ac.be).

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(1 US dollar=60 Kenyan shillings) (Table 2). The total cost of testing and treatment (RPR kits, Vacutainer collection tubes and needles, rotators and centrifuges, clinic supplies, and drugs) was \$18 429. Of the 27 377 women screened, 928 were RPR reactive and 845 were treated, resulting in a cost of US \$37 per case treated. Positive results were confirmed in only 583 (69%) of the women treated. If congenital syphilis occurs in one third of babies born to syphilitic mothers and stillbirth or prematurity in another third, the program has prevented the harmful effects of syphilis on the unborn child in 388 women, given that treatment is 100% effective. This would result in a cost of US \$56 per averted case. The real effectiveness can be estimated at 50% to 70% because of late treatment or reinfection. Hence, the cost per case averted will vary between US \$95 and US \$112.

## Discussion

Syphilis seroprevalence among pregnant women in Nairobi has decreased significantly in recent years. The RPR seroprevalence was 7.2% in 1993, 4.5% in 1996, and 3.4% in 1998.<sup>17</sup> This decline might be the result of different intervention programs and improved health care services, including the syphilis control program, which may have had an independent effect.<sup>17</sup> Hence, the program may also have had an indirect influence on the spread of HIV in this population.

Overall, the clinics performed well in screening and treating RPR-seropositive women and their partners. The partner notification rate of 53% reported here is twice as high as for nonpregnant patients with an STD other than HIV who attended the same

**TABLE 1—Syphilis Rapid Plasma Reagin (RPR) Seroreactivity and Treatment Rates at 10 Mother and Child Health (MCH) Clinics in Nairobi, Kenya**

MCH Clinic	Women Screened, n (%)	RPR+, n (%)	Women Treated, n (%)	Partners Treated, n (%)
Baba Dogo	2863 (97)	160 (6)	153 (96)	64 (42)
Dandora	4064 (97)	183 (5)	173 (95)	112 (65)
Eastleigh	1453 (86)	51 (3)	50 (98)	27 (54)
Kariobangi	2647 (85)	30 (1)	23 (77)	19 (83)
Langata	4662 (100)	168 (4)	149 (89)	74 (50)
Mathare	2793 (100)	78 (3)	78 (100)	40 (51)
Ngong Road	2749 (100)	75 (3)	58 (77)	44 (76)
Riruta	1651 (90)	41 (2)	33 (80)	11 (33)
Umoja	2458 (100)	90 (4)	80 (89)	41 (51)
Westlands	1947 (100)	52 (3)	48 (92)	20 (42)
Total	27 377 (96)	928 (3)	845 (91)	452 (53)

clinic.<sup>18</sup> Concern about the unborn baby seems to motivate future fathers to get treatment<sup>19,20</sup> and may help women to inform their partners despite the threat of possible physical abuse.<sup>21</sup>

The effectiveness of the treatment may be limited, because women in Kenya tend to come late for prenatal care.<sup>15,19</sup> It is also hampered by weak screening performance in field conditions. In 1993, only 17% of RPR-positive results and 1.2% of RPR-negative results were found to be false, but monitoring and external supervision were very intensive in the early years.<sup>16</sup> The observed reduction in the quality of the test over a 6-year period raises questions about the viability of the program. In addition, false-positive reactions might be higher in the presence of HIV.<sup>22-24</sup>

Cost-effectiveness estimates of syphilis screening during pregnancy vary widely, depending on the underlying assumptions.<sup>25-29</sup> According to a World Bank study, the prevention of congenital syphilis by routine screening and treatment is one of the most cost-effective

interventions for improving child health.<sup>30</sup> Our findings underscore this statement, but they also stress technical, logistic, and financial drawbacks that have been pointed out by others.<sup>15,16,31</sup> One should keep these problems in mind when planning HIV mother-to-child transmission programs, an area where testing and antiretroviral treatment have many more implications than with syphilis testing.

The question remains whether case detection and treatment is the best option. An alternative strategy could be mass treatment with penicillin in pregnancy. With a cost of US \$1.50 per dose and an estimated acceptability of 75%, the total cost for such a program would be US \$30 799, similar to the cost of US \$30 966 for the current program in Nairobi. With this strategy, 1075 true-positive cases (75%) would be treated, compared with 583 now. If the treatment is effective in 50% of the cases, the cost per averted case of congenital syphilis would be US \$86, a reduction of 23%. The systematic administration of antibiotics during pregnancy may also have a positive impact on pregnancy outcome.<sup>32,33</sup> Similarly, routine treatment would reduce the negative aspects of contact tracing. Concerns of mass treatment, however, are the potentially increased resistance patterns and the massive use of needles and syringes.

Syphilis control during pregnancy is an effective intervention, especially in high-prevalence areas, but it requires careful monitoring, quality control, and close supervision. □

## Contributors

K. Fonck planned the study, did the data entry and data analysis, and wrote the paper. P. Claeys supervised the data analysis and contributed to the writing of the paper. F. Bashir did the laboratory work. J. Bwayo supervised the laboratory procedures and revised the draft paper. L. Fransen contributed to the study design and planning. M. Temmerman was responsible for the study design and supervision, and the writing of the paper.

**TABLE 2—Cost in Kenyan Shillings of the Syphilis Screening Program During a 1-Year Period (1 US Dollar=60 Kenyan Shillings)**

	No. of Units	Cost/Unit	Total Cost
RPR kits	200	2 000	400 000
Vacutainers and needles	27 377	2	54 754
Rotators and centrifuges <sup>a</sup>	10	20 000	200 000
Clinic supplies	10	8 000	96 000
Drugs	1420	25	355 000
Staff salaries <sup>b</sup>			372 000
Refresher training	1	100 000	100 000
Car <sup>a</sup>	1		200 000
Transport cost			82 000
Total			1 859 754
Cost per pregnant woman			68

Note. RPR=rapid plasma reagin.

<sup>a</sup>Capital cost discounted over 5 years.

<sup>b</sup>Includes only salaries for staff involved in supervision and quality control; does not include clinic staff salaries.

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